<110> Organization Name : Carlsberg A/S

Application Project

<120> Title : Barley for production of flavor-stable beer
<130> AppFileReference : 1
<140> CurrentAppNumber :
<141> CurrentFilingDate : ____-__-__

Sequence

<213> OrganismName : Hordeum vulgare cv. Barke
<400> PreSequenceString :

atgctgctgg gagggctgat cgacaccctc acgggggcga acaagagcgc ccggctcaag 60
ggcacggtgg tgctcatgcg caagaacgtg ctggacctca acgacttcgg cgccaccatc 120
atcgacggca tcggcgagtt cctcggcaag ggcgtcacct gccagcttat cagctccacc 180
gccgtcgacc aaggtaatca ctaccctcct ccggccttct cctctgttta caagatatag 240
tatttctttc gtgtgggccg gcggccatgg atggatggat gtgtctggat cggctaaaga 300
agataggata gctagccctg gccggtcgtc tttacctgag catgggcata tgccatcgaa 360
aaaagagaca acagcatgca tgcatggtgc gcgcaccaga ccacgcagag caccggatgc 420
tcgagacaaa gcaacacaac aagcaaggac gacacgtcaa aagcaacaca acaagcaagg 480
acggcacgtc aaaagcaaca caaacctaaa ctaaagcaca aagacgtaag agcaagcaca 540
caatcagcag gctataaaca gttgtcatca aaaacaacgc tggaagagag agagaaggaa 600
ggaagtagta gccatgaaaa attaaatcac cgggcgttgc tctttgccca acaattaatc 660
aagcaggata cgtggcatgt atagttcttg taagtaaact aagcatgtga tatgagaagg 720
tacgtggtgg tgcagacaac ggcggtcgcg ggaaggtggg cgcggaggcg gagctggagc 780
agtgggtgac gagcctgccg tcgctgacga cgggggagtc caagttcggc ctcaccttcg 840
actgggaggt ggagaagctc ggggtgccgg gcgccatcgt cgtcaacaac taccacagct 900
ccgagttcct gcttaaaacc atcaccctcc acgacgtccc cggccgcagc ggcaacctca 960
ccttcgtcgc caactcatgg atctaccccg ccgccaacta ccgatacagc cgcgtcttct 1020
tcgccaacga cgtgcgtgga ttttcctcta ctttcctctc ctttcatttt caccgccttc 1080
gtcattcatg gtcgatcatt aagtcttgcc aggacaatag atgatgagct aggagtggtt 1140
accacttagc agtacgtaca ttatttattc cgtgttggta gaaaaggata tggtttggtg 1200
cagatcgaca caagattgaa tgaaagttgc accgtggcac cgtggcagcg tggtaggtga 1260
aaataactgt tgcacggatc cacccacatg attgttttca tgaataaact ttttaaggat 1320
gtgtctagcc acatctagat gcatgtcaca taattattgc ataccaaaac gattaaatta 1380
agcataaaaa gaaaaggaaa aaaatactca catatctcga cgtaagatca atgatatagt 1440
atttagatat gcaatattta tcttacatct aaacctttct tcattcctaa atataagaca 1500
tttgtaagat ttcactatgg acaacatacg aaacaaaatc agtggatctc tctatgcatt 1560

cattatgtag tctataataa aatctttaaa agatcgtata ttttgcaacg gagggagtaa 1620
aacataactt tttaatagta atgttgcacg gctccacact cgcagacgta cctgccgagc 1680
cagatgccgg cggcgctgaa gccgtaccgc gacgacgagc tccggaacct gcgtggcgac 1740
gaccagcagg gcccgtacca ggagcacgac cgcatctacc gctacgacgt ctacaacgac 1800
ctcggcgagg gccgccccat cctcggcggc aactccgacc acccttaccc gcgccgcggc 1860
cgcacggagc gcaagcccaa cgccagcgac ccgagcctgg agagccggct gtcgctgctg 1920
gagcagatct acgtgccgcg ggacgagaag ttcggccacc tcaagacgtc cgacttcctg 1980
ggctactcca tcaaggccat cacgcagggc atcctgccgg ccgtgcgcac ctacgtggac 2040
accacccccg gcgagttcga ctccttccag gacatcatca acctctatga gggcggcatc 2100
aagctgccca aggtggccgc cctggaggag ctccgtaagc agttcccgct ccagctcatc 2160
aaggacctcc tccccgtcgg cggcgactcc ctgcttaagc tccccgtgcc ccacatcatc 2220
caggagaaca agcaggcgtg gaggaccgac gaggagttcg cacgggaggt gctcgccggc 2280
gtcaacccgg tcatgatcac gcgtctcacg gtgagtcagc gattatttgt tcattgtgtg 2340
tgtatggtgt ccatggtgag aaagtgcaga tcttgatttg cgttgggtcg catgcacgca 2400
tgctgcatgc atgcaggagt tcccgccaaa aagtagtctg gaccctagca agtttggtga 2460
ccacaccagc accatcacgg cggagcacat agagaagaac ctcgagggcc tcacggtgca 2520
gcaggtaatt ggtccaagcc atcgacatca actatgattt acctaggagt aattggtagc 2580
tgtagataat ttggcttcgt tgcaattaat ttgatgctgg ccgatcaagt gatcgtattg 2640
ggtttgaaat ttgcaggcgc tggaaagcaa caggctgtac atccttgatc accatgaccg 2700
gttcatgccg ttcctgatcg acgtcaacaa cctgcccggc aacttcatct acgccacgag 2760
gaccctcttc ttcctgcgcg gcgacggcag gctcacgccg ctcgccatcg agctgagcga 2820
gcccatcatc cagggcggcc ttaccacggc caagagcaag gtttacacgc cggtgcccag 2880
cggctccgtc gaaggctggg tgtgggagct cgccaaggcc tacgtcgccg tcaatgactc 2940
cgggtggcac cagctcgtca gccactggta cgttctccac ggtcgatgtg attcagtcag 3000
tcgatgcaca acaactgatc gaaatatgat tgattgaaac gcgcaggctg aacactcacg 3060
cggtgatgga gccgttcgtg atctcgacga accggcacct tagcgtgacg cacccggtgc 3120
acaagctgct gagcccgcac taccgcgaca ccatgaccat caacgcgctg gcgcggcaga 3180
cgctcatcaa cgccggcggc atcttcgaga tgacggtgtt cccgggcaag ttcgcgttgg 3240
ggatgtcggc cgtggtgtac aaggactgga agttcaccga gcagggactg ccggacgatc 3300
tcatcaagag gtacgtacct ggtaaatgtt atgaatgtgt aaaacaaatt gggcgtctcg 3360
ctcactgaca ggaacgtggt aaaaaaaatg caggggcatg gcggtggagg acccgtcgag 3420
cccgtacaag gtgcggttgc tggtgtcgga ctacccgtac gcggcggacg ggctggcgat 3480
ctggcacgcc attgagcagt acgtgagcga gtacctggcc atctactacc cgaacgacgg 3540
cgtgctgcag ggcgatacgg aggtgcaggc gtggtggaag gagacgcgcg aggtcgggca 3600
cggcgacctc aaggacgccc catggtggcc caagatgcaa agtgtgccgg agctggccaa 3660
ggcgtgcacc accatcatct ggatcgggtc ggcgctgcat gcggcagtca acttcgggca 3720
gtacccctac gcggggttcc tcccgaaccg gccgacggtg agccggcgcc gcatgccgga 3780
gcccggcacg gaggagtacg cggagctgga gcgcgacccg gagcgggcct tcatccacac 3840
catcacgagc cagatccaga ccatcatcgg cgtgtcgctg ctggaggtgc tgtcgaagca 3900

ctcctccgac gagctgtacc tcgggcagcg ggacacgccg gagtggacct cggacccaaa 3960
ggccctggag gtgttcaagc ggttcagcga ccggctggtg gagatcgaga gcaaggtggt 4020
gggcatgaac catgacccgg agctcaagaa ccgcaacggc ccggctaagt ttccctacat 4080
gctgctctac cccaacacct ccgaccacaa gggcgccgct gccgggctta ccgccaaggg 4140
catccccaac agcatctcca tctaa 4165

<212> Type : DNA
<211> Length : 4165
SequenceName : SEQ ID NO: 1
SequenceDescription : Barley genomic sequence of cv. Barke, spanning
the start and stop codons of the gene encoding LOX-1

Sequence

<213> OrganismName : Hordeum vulgare mutant D112
<400> PreSequenceString :

atgctgctgg gagggctgat cgacaccctc acgggggcga acaagagcgc ccggctcaag 60
ggcacggtgg tgctcatgcg caagaacgtg ctggacctca acgacttcgg cgccaccatc 120
atcgacggca tcggcgagtt cctcggcaag ggcgtcacct gccagcttat cagctccacc 180
gccgtcgacc aaggtaatca ctaccctcct ccggccttct cctctgttta caagatatag 240
tatttctttc gtgtgggccg gcggccatgg atggatggat gtgtctggat cggctaaaga 300
agataggata gctagccctg gccggtcgtc tttacctgag catgggcata tgccatcgaa 360
aaaagagaca acagcatgca tgcatggtgc gcgcaccaga ccacgcagag caccggatgc 420
tcgagacaaa gcaacacaac aagcaaggac gacacgtcaa aagcaacaca acaagcaagg 480
acggcacgtc aaaagcaaca caaacctaaa ctaaagcaca aagacgtaag agcaagcaca 540
caatcagcag gctataaaca gttgtcatca aaaacaacgc tggaagagag agagaaggaa 600
ggaagtagta gccatgaaaa attaaatcac cgggcgttgc tctttgccca acaattaatc 660
aagcaggata cgtggcatgt atagttcttg taagtaaact aagcatgtga tatgagaagg 720
tacgtggtgg tgcagacaac ggcggtcgcg ggaaggtggg cgcggaggcg gagctggagc 780
agtgggtgac gagcctgccg tcgctgacga cgggggagtc caagttcggc ctcaccttcg 840
actgggaggt ggagaagctc ggggtgccgg gcgccatcgt cgtcaacaac taccacagct 900
ccgagttcct gcttaaaacc atcaccctcc acgacgtccc cggccgcagc ggcaacctca 960
ccttcgtcgc caactcatgg atctaccccg ccgccaacta ccgatacagc cgcgtcttct 1020
tcgccaacga cgtgcgtgga ttttcctcta ctttcctctc ctttcatttt caccgccttc 1080
gtcattcatg gtcgatcatt aagtcttgcc aggacaatag atgatgagct aggagtggtt 1140
accacttagc agtacgtaca ttatttattc cgtgttggta gaaaaggata tggtttggtg 1200
cagatcgaca caagattgaa tgaaagttgc accgtggcac cgtggcagcg tggtaggtga 1260
aaataactgt tgcacggatc cacccacatg attgttttca tgaataaact ttttaaggat 1320
gtgtctagcc acatctagat gcatgtcaca taattattgc ataccaaaac gattaaatta 1380

agcataaaaa gaaaaggaaa aaaatactca catatctcga cgtaagatca atgatatagt 1440
atttagatat gcaatattta tcttacatct aaacctttct tcattcctaa atataagaca 1500
tttgtaagat ttcactatgg acaacatacg aaacaaaatc agtggatctc tctatgcatt 1560
cattatgtag tctataataa aatctttaaa agatcgtata ttttgcaacg gagggagtaa 1620
aacataactt tttaatagta atgttgcacg gctccacact cgcagacgta cctgccgagc 1680
cagatgccgg cggcgctgaa gccgtaccgc gacgacgagc tccggaacct gcgtggcgac 1740
gaccagcagg gcccgtacca ggagcacgac cgcatctacc gctacgacgt ctacaacgac 1800
ctcggcgagg gccgccccat cctcggcggc aactccgacc acccttaccc gcgccgcggc 1860
cgcacggagc gcaagcccaa cgccagcgac ccgagcctgg agagccggct gtcgctgctg 1920
gagcagatct acgtgccgcg ggacgagaag ttcggccacc tcaagacgtc cgacttcctg 1980
ggctactcca tcaaggccat cacgcagggc atcctgccgg ccgtgcgcac ctacgtggac 2040
accacccccg gcgagttcga ctccttccag gacatcatca acctctatga gggcggcatc 2100
aagctgccca aggtggccgc cctggaggag ctccgtaagc agttcccgct ccagctcatc 2160
aaggacctcc tccccgtcgg cggcgactcc ctgcttaagc tccccgtgcc ccacatcatc 2220
caggagaaca agcaggcgtg gaggaccgac gaggagttcg cacgggaggt gctcgccggc 2280
gtcaacccgg tcatgatcac gcgtctcacg gtgagtcagc gattatttgt tcattgtgtg 2340
tgtatggtgt ccatggtgag aaagtgcaga tcttgatttg cgttgggtcg catgcacgca 2400
tgctgcatgc atgcaggagt tcccgccaaa aagtagtctg gaccctagca agtttggtga 2460
ccacaccagc accatcacgg cggagcacat agagaagaac ctcgagggcc tcacggtgca 2520
gcaggtaatt ggtccaagcc atcgacatca actatgattt acctaggagt aattggtagc 2580
tgtagataat ttggcttcgt tgcaattaat ttgatgctgg ccgatcaagt gatcgtattg 2640
ggtttgaaat ttgcaggcgc tggaaagcaa caggctgtac atccttgatc accatgaccg 2700
gttcatgccg ttcctgatcg acgtcaacaa cctgcccggc aacttcatct acgccacgag 2760
gaccctcttc ttcctgcgcg gcgacggcag gctcacgccg ctcgccatcg agctgagcga 2820
gcccatcatc cagggcggcc ttaccacggc caagagcaag gtttacacgc cggtgcccag 2880
cggctccgtc gaaggctggg tgtgggagct cgccaaggcc tacgtcgccg tcaatgactc 2940
cgggtggcac cagctcgtca gccactggta cgttctccac ggtcgatgtg attcagtcag 3000
tcgatgcaca acaactgatc gaaatatgat tgattgaaac gcgcaggctg aacactcacg 3060
cggtgatgga gccgttcgtg atctcgacga accggcacct tagcgtgacg cacccggtgc 3120
acaagctgct gagcccgcac taccgcgaca ccatgaccat caacgcgctg gcgcggcaga 3180
cgctcatcaa cgccggcggc atcttcgaga tgacggtgtt cccgggcaag ttcgcgttgg 3240
ggatgtcggc cgtggtgtac aaggactgga agttcaccga gcagggactg ccggacgatc 3300
tcatcaagag gtacgtacct ggtaaatgtt atgaatgtgt aaaacaaatt gggcgtctcg 3360
ctcactgaca ggaacgtggt aaaaaaaatg caggggcatg gcggtggagg acccgtcgag 3420
cccgtacaag gtgcggttgc tggtgtcgga ctacccgtac gcggcggacg ggctggcgat 3480
ctggcacgcc attgagcagt acgtgagcga gtacctggcc atctactacc cgaacgacgg 3540
cgtgctgcag ggcgatacgg aggtgcaggc gtgatggaag gagacgcgcg aggtcgggca 3600
cggcgacctc aaggacgccc catggtggcc caagatgcaa agtgtgccgg agctggccaa 3660
ggcgtgcacc accatcatct ggatcgggtc ggcgctgcat gcggcagtca acttcgggca 3720

gtacccctac gcggggttcc tcccgaaccg gccgacggtg agccggcgcc gcatgccgga 3780
gcccggcacg gaggagtacg cggagctgga gcgcgacccg gagcgggcct tcatccacac 3840
catcacgagc cagatccaga ccatcatcgg cgtgtcgctg ctggaggtgc tgtcgaagca 3900
ctcctccgac gagctgtacc tcgggcagcg ggacacgccg gagtggacct cggacccaaa 3960
ggccctggag gtgttcaagc ggttcagcga ccggctggtg gagatcgaga gcaaggtggt 4020
gggcatgaac catgacccgg agctcaagaa ccgcaacggc ccggctaagt ttccctacat 4080
gctgctctac cccaacacct ccgaccacaa gggcgccgct gccgggctta ccgccaaggg 4140
catccccaac agcatctcca tctaa 4165

<212> Type : DNA

<211> Length : 4165

SequenceName : SEQ ID NO: 2

SequenceDescription : Barley genomic sequence of mutant D112 spanning the segment, corresponding to the region between the start and stop codons of the gene encoding LOX-1 of cv. Barke

Sequence

<213> OrganismName : Hordeum vulgare cv. Barke

<400> PreSequenceString :

MLLGGLIDTL TGANKSARLK GTVVLMRKNV LDLNDFGATI IDGIGEFLGK GVTCQLISST 60
AVDQDNGGRG KVGAEAELEQ WVTSLPSLTT GESKFGLTFD WEVEKLGVPG AIVVNNYHSS 120
EFLLKTITLH DVPGRSGNLT FVANSWIYPA ANYRYSRVFF ANDTYLPSQM PAALKPYRDD 180
ELRNLRGDDQ QGPYQEHDRI YRYDVYNDLG EGRPILGGNS DHPYPRRGRT ERKPNASDPS 240
LESRLSLLEQ IYVPRDEKFG HLKTSDFLGY SIKAITQGIL PAVRTYVDTT PGEFDSFQDI 300
INLYEGGIKL PKVAALEELR KQFPLQLIKD LLPVGGDSLL KLPVPHIIQE NKQAWRTDEE 360
FAREVLAGVN PVMITRLTEF PPKSSLDPSK FGDHTSTITA EHIEKNLEGL TVQQALESNR 420
LYILDHHDRF MPFLIDVNNL PGNFIYATRT LFFLRGDGRL TPLAIELSEP IIQGGLTTAK 480
SKVYTPVPSG SVEGWVWELA KAYVAVNDSG WHQLVSHWLN THAVMEPFVI STNRHLSVTH 540
PVHKLLSPHY RDTMTINALA RQTLINAGGI FEMTVFPGKF ALGMSAVVYK DWKFTEQGLP 600
DDLIKRGMAV EDPSSPYKVR LLVSDYPYAA DGLAIWHAIE QYVSEYLAIY YPNDGVLQGD 660
TEVQAWWKET REVGHGDLKD APWWPKMQSV PELAKACTTI IWIGSALHAA VNFGQYPYAG 720
FLPNRPTVSR RRMPEPGTEE YAELERDPER AFIHTITSQI QTIIGVSLLE VLSKHSSDEL 780
YLGQRDTPEW TSDPKALEVF KRFSDRLVEI ESKVVGMNHD PELKNRNGPA KFPYMLLYPN 840
TSDHKGAAAG LTAKGIPNSI SI 862

<212> Type : PRT

<211> Length : 862

SequenceName : SEQ ID NO: 3

SequenceDescription : Protein sequence of full-length LOX-1 protein of cv. Barke

Sequence

<213> OrganismName : Hordeum vulgare mutant D112
<400> PreSequenceString :
MLLGGLIDTL TGANKSARLK GTVVLMRKNV LDLNDFGATI IDGIGEFLGK GVTCQLISST 60
AVDQDNGGRG KVGAEAELEQ WVTSLPSLTT GESKFGLTFD WEVEKLGVPG AIVVNNYHSS 120
EFLLKTITLH DVPGRSGNLT FVANSWIYPA ANYRYSRVFF ANDTYLPSQM PAALKPYRDD 180
ELRNLRGDDQ QGPYQEHDRI YRYDVYNDLG EGRPILGGNS DHPYPRRGRT ERKPNASDPS 240
LESRLSLLEQ IYVPRDEKFG HLKTSDFLGY SIKAITQGIL PAVRTYVDTT PGEFDSFQDI 300
INLYEGGIKL PKVAALEELR KQFPLQLIKD LLPVGGDSLL KLPVPHIIQE NKQAWRTDEE 360
FAREVLAGVN PVMITRLTEF PPKSSLDPSK FGDHTSTITA EHIEKNLEGL TVQQALESNR 420
LYILDHHDRF MPFLIDVNNL PGNFIYATRT LFFLRGDGRL TPLAIELSEP IIQGGLTTAK 480
SKVYTPVPSG SVEGWVWELA KAYVAVNDSG WHQLVSHWLN THAVMEPFVI STNRHLSVTH 540
PVHKLLSPHY RDTMTINALA RQTLINAGGI FEMTVFPGKF ALGMSAVVYK DWKFTEQGLP 600
DDLIKRGMAV EDPSSPYKVR LLVSDYPYAA DGLAIWHAIE QYVSEYLAIY YPNDGVLQGD 660
TEVQA 665
<212> Type : PRT
<211> Length : 665
SequenceName : SEQ ID NO: 4
SequenceDescription : Protein sequence of inactive,
truncated LOX-1 of mutant D112

Sequence

<213> OrganismName : Hordeum vulgare cv. Neruda
<400> PreSequenceString :
atgctgctgg gagggctgat cgacaccctc acgggggcga acaagagcgc ccggctcaag 60
ggcacggtgg tgctcatgcg caagaacgtg ctggacctca acgacttcgg cgccaccatc 120
atcgacggca tcggcgagtt cctcggcaag ggcgtcacct gccagcttat cagctccacc 180
gccgtcgacc aaggtaatca ctaccctcct ccggccttct cctctgttta caagatatag 240
tatttctttc gtgtgggccg gcggccatgg atggatggat gtgtctggat cggctaaaga 300
agataggata gctagccctg gccggtcgtc tttacctgag catgggcata tgccatcgaa 360
aaaagagaca acagcatgca tgcatggtgc gcgcaccaga ccacgcagag caccggatgc 420
tcgagacaaa gcaacacaac aagcaaggac gacacgtcaa aagcaacaca acaagcaagg 480
acggcacgtc aaaagcaaca caaacctaaa ctaaagcaca aagacgtaag agcaagcaca 540
caatcagcag gctataaaca gttgtcatca aaaacaacgc tggaagagag agagaaggaa 600
ggaagtagta gccatgaaaa attaaatcac cgggcgttgc tctttgccca acaattaatc 660
aagcaggata cgtggcatgt atagttcttg taagtaaact aagcatgtga tatgagaagg 720

tacgtggtgg tgcagacaac ggcggtcgcg ggaaggtggg cgcggaggcg gagctggagc 780
agtgggtgac gagcctgccg tcgctgacga cgggggagtc caagttcggc ctcaccttcg 840
actgggaggt ggagaagctc ggggtgccgg gcgccatcgt cgtcaacaac taccacagct 900
ccgagttcct gcttaaaacc atcaccctcc acgacgtccc cggccgcagc ggcaacctca 960
ccttcgtcgc caactcatgg atctaccccg ccgccaacta ccgatacagc cgcgtcttct 1020
tcgccaacga cgtgcgtgga ttttcctcta ctttcctctc ctttcatttt caccgccttc 1080
gtcattcatg gtcgatcatt aagtcttgcc aggacaatag atgatgagct aggagtggtt 1140
accacttagc agtacgtaca ttatttattc cgtgttggta gaaaaggata tggtttggtg 1200
cagatcgaca caagattgaa tgaaagttgc accgtggcac cgtggcagcg tggtaggtga 1260
aaataactgt tgcacggatc cacccacatg attgttttca tgaataaact ttttaaggat 1320
gtgtctagcc acatctagat gcatgtcaca taattattgc ataccaaaac gattaaatta 1380
agcataaaaa gaaaaggaaa aaaatactca catatctcga cgtaagatca atgatatagt 1440
atttagatat gcaatattta tcttacatct aaacctttct tcattcctaa atataagaca 1500
tttgtaagat ttcactatgg acaacatacg aaacaaaatc agtggatctc tctatgcatt 1560
cattatgtag tctataataa aatctttaaa agatcgtata ttttgcaacg gagggagtaa 1620
aacataactt tttaatagta atgttgcacg gctccacact cgcagacgta cctgccgagc 1680
cagatgccgg cggcgctgaa gccgtaccgc gacgacgagc tccggaacct gcgtggcgac 1740
gaccagcagg gcccgtacca ggagcacgac cgcatctacc gctacgacgt ctacaacgac 1800
ctcggcgagg gccgccccat cctcggcggc aactccgacc acccttaccc gcgccgcggc 1860
cgcacggagc gcaagcccaa cgccagcgac ccgagcctgg agagccggct gtcgctgctg 1920
gagcagatct acgtgccgcg ggacgagaag ttcggccacc tcaagacgtc cgacttcctg 1980
ggctactcca tcaaggccat cacgcagggc atcctgccgg ccgtgcgcac ctacgtggac 2040
accacccccg gcgagttcga ctccttccag gacatcatca acctctatga gggcggcatc 2100
aagctgccca aggtggccgc cctggaggag ctccgtaagc agttcccgct ccagctcatc 2160
aaggacctcc tccccgtcgg cggcgactcc ctgcttaagc tccccgtgcc ccacatcatc 2220
caggagaaca agcaggcgtg gaggaccgac gaggagttcg cacgggaggt gctcgccggc 2280
gtcaacccgg tcatgatcac gcgtctcacg gtgagtcagc gattatttgt tcattgtgtg 2340
tgtatggtgt ccatggtgag aaagtgcaga tcttgatttg cgttgggtcg catgcacgca 2400
tgctgcatgc atgcaggagt tcccgccaaa aagtagtctg gaccctagca agtttggtga 2460
ccacaccagc accatcacgg cggagcacat agagaagaac ctcgagggcc tcacggtgca 2520
gcaggtaatt ggtccaagcc atcgacatca actatgattt acctaggagt aattggtagc 2580
tgtagataat ttggcttcgt tgcaattaat ttgatgctgg ccgatcaagt gatcgtattg 2640
ggtttgaaat ttgcaggcgc tggaaagcaa caggctgtac atccttgatc accatgaccg 2700
gttcatgccg ttcctgatcg acgtcaacaa cctgcccggc aacttcatct acgccacgag 2760
gaccctcttc ttcctgcgcg gcgacggcag gctcacgccg ctcgccatcg agctgagcga 2820
gcccatcatc cagggcggcc ttaccacggc caagagcaag gtttacacgc cggtgcccag 2880
cggctccgtc gaaggctggg tgtgggagct cgccaaggcc tacgtcgccg tcaatgactc 2940
cgggtggcac cagctcgtca gccactggta cgttctccac ggtcgatgtg attcagtcag 3000
tcgatgcaca acaactgatc gaaatatgat tgattgaaac gcgcaggctg aacactcacg 3060

cggtgatgga gccgttcgtg atctcgacga accggcacct tagcgtgacg cacccggtgc 3120
acaagctgct gagcccgcac taccgcgaca ccatgaccat caacgcgctg gcgcggcaga 3180
cgctcatcaa cgccggcggc atcttcgaga tgacggtgtt cccgggcaag ttcgcgttgg 3240
ggatgtcggc cgtggtgtac aaggactgga agttcaccga gcagggactg ccggacgatc 3300
tcatcaagag gtacgtacct ggtaaatgtt atgaatgtgt aaaacaaatt gggcgtctcg 3360
ctcactgaca ggaacgtggt aaaaaaaatg caggggcatg gcggtggagg acccgtcgag 3420
cccgtacaag gtgcggttgc tggtgtcgga ctacccgtac gcggcggacg ggctggcgat 3480
ctggcacgcc attgagcagt acgtgagcga gtacctggcc atctactacc cgaacgacgg 3540
cgtgctgcag ggcgatacgg aggtgcaggc gtggtggaag gagacgcgcg aggtcgggca 3600
cggcgacctc aaggacgccc catggtggcc caagatgcaa agtgtgccgg agctggccaa 3660
ggcgtgcacc accatcatct ggatcgggtc ggcgctgcat gcggcagtca acttcgggca 3720
gtacccctac gcggggttcc tcccgaaccg gccgacggtg agccggcgcc gcatgccgga 3780
gcccggcacg gaggagtacg cggagctgga gcgcgacccg gagcgggcct tcatccacac 3840
catcacgagc cagatccaga ccatcatcgg cgtgtcgctg ctggaggtgc tgtcgaagca 3900
ctcctccgac gagctgtacc tcgggcagcg ggacacgccg gagtggacct cggacccaaa 3960
ggccctggag gtgttcaagc ggttcagcga ccggctggtg gagatcgaga gcaaggtggt 4020
gggcatgaac catgacccgg agctcaagaa ccgcaacggc ccggctaagt ttccctacat 4080
gctgctctac cccaacacct ccgaccacaa gggcgccgct gccgggctta ccgccaaggg 4140
catccccaac agcatctcca tctaa 4165

<212> Type : DNA
<211> Length : 4165
SequenceName : SEQ ID NO: 5
SequenceDescription : Barley genomic sequence of cv. Neruda spanning the start and stop codons of the gene encoding LOX-1

Sequence

<213> OrganismName : Hordeum vulgare mutant A618
<400> PreSequenceString :

atgctgctgg gagggctgat cgacaccctc acgggggcga acaagagcgc ccggctcaag 60
ggcacggtgg tgctcatgcg caagaacgtg ctggacctca acgacttcgg cgccaccatc 120
atcgacggca tcggcgagtt cctcggcaag ggcgtcacct gccagcttat cagctccacc 180
gccgtcgacc aaggtaatca ctaccctcct ccggccttct cctctgttta caagatatag 240
tatttctttc gtgtgggccg gcggccatgg atggatggat gtgtctggat cggctaaaga 300
agataggata gctagccctg gccggtcgtc tttacctgag catgggcata tgccatcgaa 360
aaaagagaca acagcatgca tgcatggtgc gcgcaccaga ccacgcagag caccggatgc 420
tcgagacaaa gcaacacaac aagcaaggac gacacgtcaa aagcaacaca acaagcaagg 480
acggcacgtc aaaagcaaca caaacctaaa ctaaagcaca aagacgtaag agcaagcaca 540
caatcagcag gctataaaca gttgtcatca aaaacaacgc tggaagagag agagaaggaa 600

ggaagtagta gccatgaaaa attaaatcac cgggcgttgc tctttgccca acaattaatc 660
aagcaggata cgtggcatgt atagttcttg taagtaaact aagcatgtga tatgagaagg 720
tacgtggtgg tgcagacaac ggcggtcgcg ggaaggtggg cgcggaggcg gagctggagc 780
agtgggtgac gagcctgccg tcgctgacga cgggggagtc caagttcggc ctcaccttcg 840
actgggaggt ggagaagctc ggggtgccgg gcgccatcgt cgtcaacaac taccacagct 900
ccgagttcct gcttaaaacc atcaccctcc acgacgtccc cggccgcagc ggcaacctca 960
ccttcgtcgc caactcatgg atctaccccg ccgccaacta ccgatacagc cgcgtcttct 1020
tcgccaacga cgtgcgtgga ttttcctcta ctttcctctc ctttcatttt caccgccttc 1080
gtcattcatg gtcgatcatt aagtcttgcc aggacaatag atgatgagct aggagtggtt 1140
accacttagc agtacgtaca ttatttattc cgtgttggta gaaaaggata tggtttggtg 1200
cagatcgaca caagattgaa tgaaagttgc accgtggcac cgtggcagcg tggtaggtga 1260
aaataactgt tgcacggatc cacccacatg attgttttca tgaataaact ttttaaggat 1320
gtgtctagcc acatctagat gcatgtcaca taattattgc ataccaaaac gattaaatta 1380
agcataaaaa gaaaaggaaa aaaatactca catatctcga cgtaagatca atgatatagt 1440
atttagatat gcaatattta tcttacatct aaacctttct tcattcctaa atataagaca 1500
tttgtaagat ttcactatgg acaacatacg aaacaaaatc agtggatctc tctatgcatt 1560
cattatgtag tctataataa aatctttaaa agatcgtata ttttgcaacg gagggagtaa 1620
aacataactt tttaatagta atgttgcacg gctccacact cgcagacgta cctgccgagc 1680
cagatgccgg cggcgctgaa gccgtaccgc gacgacgagc tccggaacct gcgtggcgac 1740
gaccagcagg gcccgtacca ggagcacgac cgcatctacc gctacgacgt ctacaacgac 1800
ctcggcgagg gccgccccat cctcggcggc aactccgacc acccttaccc gcgccgcggc 1860
cgcacggagc gcaagcccaa cgccagcgac ccgagcctgg agagccggct gtcgctgctg 1920
gagcagatct acgtgccgcg ggacgagaag ttcggccacc tcaagacgtc cgacttcctg 1980
ggctactcca tcaaggccat cacgcagggc atcctgccgg ccgtgcgcac ctacgtggac 2040
accacccccg gcgagttcga ctccttccag gacatcatca acctctatga gggcggcatc 2100
aagctgccca aggtggccgc cctggaggag ctccgtaagc agttcccgct ccagctcatc 2160
aaggacctcc tccccgtcgg cggcgactcc ctgcttaagc tccccgtgcc ccacatcatc 2220
caggagaaca agcaggcgtg gaggaccgac gaggagttcg cacgggaggt gctcgccggc 2280
gtcaacccgg tcatgatcac gcgtctcacg atgagtcagc gattatttgt tcattgtgtg 2340
tgtatggtgt ccatggtgag aaagtgcaga tcttgatttg cgttgggtcg catgcacgca 2400
tgctgcatgc atgcaggagt tcccgccaaa aagtagtctg gaccctagca agtttggtga 2460
ccacaccagc accatcacgg cggagcacat agagaagaac ctcgagggcc tcacggtgca 2520
gcaggtaatt ggtccaagcc atcgacatca actatgattt acctaggagt aattggtagc 2580
tgtagataat ttggcttcgt tgcaattaat ttgatgctgg ccgatcaagt gatcgtattg 2640
ggtttgaaat ttgcaggcgc tggaaagcaa caggctgtac atccttgatc accatgaccg 2700
gttcatgccg ttcctgatcg acgtcaacaa cctgcccggc aacttcatct acgccacgag 2760
gaccctcttc ttcctgcgcg gcgacggcag gctcacgccg ctcgccatcg agctgagcga 2820
gcccatcatc cagggcggcc ttaccacggc caagagcaag gtttacacgc cggtgcccag 2880
cggctccgtc gaaggctggg tgtgggagct cgccaaggcc tacgtcgccg tcaatgactc 2940

cgggtggcac cagctcgtca gccactggta cgttctccac ggtcgatgtg attcagtcag 3000
tcgatgcaca acaactgatc gaaatatgat tgattgaaac gcgcaggctg aacactcacg 3060
cggtgatgga gccgttcgtg atctcgacga accggcacct tagcgtgacg cacccggtgc 3120
acaagctgct gagcccgcac taccgcgaca ccatgaccat caacgcgctg gcgcggcaga 3180
cgctcatcaa cgccggcggc atcttcgaga tgacggtgtt cccgggcaag ttcgcgttgg 3240
ggatgtcggc cgtggtgtac aaggactgga agttcaccga gcagggactg ccggacgatc 3300
tcatcaagag gtacgtacct ggtaaatgtt atgaatgtgt aaaacaaatt gggcgtctcg 3360
ctcactgaca ggaacgtggt aaaaaaaatg caggggcatg gcggtggagg acccgtcgag 3420
cccgtacaag gtgcggttgc tggtgtcgga ctacccgtac gcggcggacg ggctggcgat 3480
ctggcacgcc attgagcagt acgtgagcga gtacctggcc atctactacc cgaacgacgg 3540
cgtgctgcag ggcgatacgg aggtgcaggc gtggtggaag gagacgcgcg aggtcgggca 3600
cggcgacctc aaggacgccc catggtggcc caagatgcaa agtgtgccgg agctggccaa 3660
ggcgtgcacc accatcatct ggatcgggtc ggcgctgcat gcggcagtca acttcgggca 3720
gtacccctac gcggggttcc tcccgaaccg gccgacggtg agccggcgcc gcatgccgga 3780
gcccggcacg gaggagtacg cggagctgga gcgcgacccg gagcgggcct tcatccacac 3840
catcacgagc cagatccaga ccatcatcgg cgtgtcgctg ctggaggtgc tgtcgaagca 3900
ctcctccgac gagctgtacc tcgggcagcg ggacacgccg gagtggacct cggacccaaa 3960
ggccctggag gtgttcaagc ggttcagcga ccggctggtg gagatcgaga gcaaggtggt 4020
gggcatgaac catgacccgg agctcaagaa ccgcaacggc ccggctaagt ttccctacat 4080
gctgctctac cccaacacct ccgaccacaa gggcgccgct gccgggctta ccgccaaggg 4140
catccccaac agcatctcca tctaa 4165

<212> Type : DNA
<211> Length : 4165
SequenceName : SEQ ID NO: 6
SequenceDescription : Barley genomic sequence of mutant A618, spanning the segment corresponding to the region between the start and stop codons of the gene encoding LOX-1 of cv. Neruda

Sequence

<213> OrganismName : Hordeum vulgare cv. Neruda
<400> PreSequenceString :

MLLGGLIDTL TGANKSARLK GTVVLMRKNV LDLNDFGATI IDGIGEFLGK GVTCQLISST 60
AVDQDNGGRG KVGAEAELEQ WVTSLPSLTT GESKFGLTFD WEVEKLGVPG AIVVNNYHSS 120
EFLLKTITLH DVPGRSGNLT FVANSWIYPA ANYRYSRVFF ANDTYLPSQM PAALKPYRDD 180
ELRNLRGDDQ QGPYQEHDRI YRYDVYNDLG EGRPILGGNS DHPYPRRGRT ERKPNASDPS 240
LESRLSLLEQ IYVPRDEKFG HLKTSDFLGY SIKAITQGIL PAVRTYVDTT PGEFDSFQDI 300
INLYEGGIKL PKVAALEELR KQFPLQLIKD LLPVGGDSLL KLPVPHIIQE NKQAWRTDEE 360
FAREVLAGVN PVMITRLTEF PPKSSLDPSK FGDHTSTITA EHIEKNLEGL TVQQALESNR 420

LYILDHHDRF MPFLIDVNNL PGNFIYATRT LFFLRGDGRL TPLAIELSEP IIQGGLTTAK 480
SKVYTPVPSG SVEGWVWELA KAYVAVNDSG WHQLVSHWLN THAVMEPFVI STNRHLSVTH 540
PVHKLLSPHY RDTMTINALA RQTLINAGGI FEMTVFPGKF ALGMSAVVYK DWKFTEQGLP 600
DDLIKRGMAV EDPSSPYKVR LLVSDYPYAA DGLAIWHAIE QYVSEYLAIY YPNDGVLQGD 660
TEVQAWWKET REVGHGDLKD APWWPKMQSV PELAKACTTI IWIGSALHAA VNFGQYPYAG 720
FLPNRPTVSR RRMPEPGTEE YAELERDPER AFIHTITSQI QTIIGVSLLE VLSKHSSDEL 780
YLGQRDTPEW TSDPKALEVF KRFSDRLVEI ESKVVGMNHD PELKNRNGPA KFPYMLLYPN 840
TSDHKGAAAG LTAKGIPNSI SI 862

<212> Type : PRT
<211> Length : 862
SequenceName : SEQ ID NO: 7
SequenceDescription : Protein sequence of full-length LOX-1 protein of cv. Neruda

Sequence

<213> OrganismName : Hordeum vulgare mutant A618
<400> PreSequenceString :
MLLGGLIDTL TGANKSARLK GTVVLMRKNV LDLNDFGATI IDGIGEFLGK GVTCQLISST 60
AVDQDNGGRG KVGAEAELEQ WVTSLPSLTT GESKFGLTFD WEVEKLGVPG AIVVNNYHSS 120
EFLLKTITLH DVPGRSGNLT FVANSWIYPA ANYRYSRVFF ANDTYLPSQM PAALKPYRDD 180
ELRNLRGDDQ QGPYQEHDRI YRYDVYNDLG EGRPILGGNS DHPYPRRGRT ERKPNASDPS 240
LESRLSLLEQ IYVPRDEKFG HLKTSDFLGY SIKAITQGIL PAVRTYVDTT PGEFDSFQDI 300
INLYEGGIKL PKVAALEELR KQFPLQLIKD LLPVGGDSLL KLPVPHIIQE NKQAWRTDEE 360
FAREVLAGVN PVMITRLTMS QRLFVHCVCM VSMVRKCRS 399

<212> Type : PRT
<211> Length : 399
SequenceName : SEQ ID NO: 8
SequenceDescription : Protein sequence of inactive, truncated LOX-1 of mutant A618

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
gaaagcgagg agaggaggcc aagaacaa 28

<212> Type : DNA
<211> Length : 28
SequenceName : SEQ ID NO: 9

SequenceDescription : Oligonucleotide primer used for PCR amplification (sense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
ttattcatcc atggttgccg atggcttaga 30
<212> Type : DNA
<211> Length : 30
SequenceName : SEQ ID NO: 10
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
agggactgcc ggacgatctc a 21
<212> Type : DNA
<211> Length : 21
SequenceName : SEQ ID NO: 11
SequenceDescription : Oligonucleotide primer used for PCR amplification (sense primer)

Sequence

<213> OrganismName : Oligonucletide
<400> PreSequenceString :
gccagctccg gcacactt 18
<212> Type : DNA
<211> Length : 18
SequenceName : SEQ ID NO: 12
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer)

Sequence

<213> OrganismName : Oligonucleotide

<400> PreSequenceString :
caaggtgcgg ttgctggtgt c 21
<212> Type : DNA
<211> Length : 21
SequenceName : SEQ ID NO: 13
SequenceDescription : Oligonucleotide primer used for PCR amplification (sense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
ctcgcgcgtc tccttccac 19
<212> Type : DNA
<211> Length : 19
SequenceName : SEQ ID NO: 14
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer) Sequence
---
<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
ctcgcgcgtc tccttccat 19
<212> Type : DNA
<211> Length : 19
SequenceName : SEQ ID NO: 15
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
tacgtgccgc gggacgagaa g 21
<212> Type : DNA
<211> Length : 21
SequenceName : SEQ ID NO: 16
SequenceDescription : Oligonucleotide primer used for PCR amplification (sense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
tgatcatgac cgggttgacg t 21
<212> Type : DNA
<211> Length : 21
SequenceName : SEQ ID NO: 17
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
catatgctgc tgggagggct g 21
<212> Type : DNA
<211> Length : 21
SequenceName : SEQ ID NO: 18
SequenceDescription : Oligonucleotide primer used for PCR amplification (sense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
gaattcttag atggagatgc tgttggg 27
<212> Type : DNA
<211> Length : 27
SequenceName : SEQ ID NO: 19
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
ctacccgtac gcggcggacg ggct 24
<212> Type : DNA

<211> Length : 24
SequenceName : SEQ ID NO: 20
SequenceDescription : Oligonucleotide primer used for PCR amplification (sense primer)

Sequence

<213> OrganismName : Oligonucleotide
<400> PreSequenceString :
tcctgaattc acgcctgcac ctccgtatcg c 31
<212> Type : DNA
<211> Length : 31
SequenceName : SEQ ID NO: 21
SequenceDescription : Oligonucleotide primer used for PCR amplification (antisense primer)